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ABSTRACT

A study on modeling systems was conducted to examine the extent of model use and the usefulness of the analytical models currently available. Specific study objectives were to identify: the users of some of the most frequently used modeling systems, the reasons for the selection of particular models, the problems and successes of implementation, user perceptions of the usefulness of models in decisionmaking and planning, and user perceptions of the likelihood of future use of models in institutions of higher education. A questionnaire was sent to project leaders to determine the selection process, objectives, implementation problems, and current and future use. A second questionnaire was directed to academic and financial administrators and focused on model-selection, objectives, and future use. A total of 394 institutions were identified as having access to one of the four modeling systems (CAMPUS, HELP/PLANPAC, RESPA, and SEARCH). Representatives of 199 of the 394 institutions responded to the first questionnaire, and 132 representatives responded to the second questionnaire. It was found that there is considerably more willingness to rely on models for long-range planning than for day-to-day decisionmaking. A comparison of the responses of the two groups is made, findings are analyzed by institutional classification, and successes and problems are discussed. Sample questionnaires and a bibliography are included. (SW)

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Experience with Analytical Models in Higher Education Management

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Experience with Analytical Models in Higher Education Management

By Paul J. Plourde

June, 1978

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INTRODUCTION

In recent years, much attention has been given to the use of analytical models as aids to college and university administrators. These models, most of which are computer-based, provide a structured form of analysis and computation of the many variables associated with resource-allocation decisions.

Computerized analytical models became available after the developments of Judy and Levine, Weathersby, and Koenig et al.[1] Since the early 1960's a considerable effort has been made by some model-designers to improve the ability of models to aid in planning and decision-making. As Bell has said, ". . .the primary purpose of [certain] models is to provide advice to university decision-makers that will improve their predictive powers and lead to improved policy decision."[2] Some higher-education researchers[3] have even predicted that the use of analytical models will be necessary to analyze the future consequences of alternative courses of action.

Other researchers, such as Dresch and Hopkins,[4] have expressed considerable doubt about the usefulness of analytical models in higher education. But most authors argue from a theoretical rather than an experiential perspective, since there is a dearth of information focusing on actual institutional experience with models.

In order to provide additional information based on institutional experience, a nationwide study of model-users was undertaken in 1975. The findings of this study, reported here, indicate that experienced users have had little success with models; yet they believe that models should continue to be used, and that further model-development should be encouraged.

I. THE CEMS SURVEY

The Center for Educational Management Studies (CEMS) at the University of Massachusetts at Amherst initiated this research project to provide information to institutions and other interested parties on the problems and successes experienced with modeling systems.

The purpose of the study was to examine the extent of model use and to determine the usefulness of the analytical models currently available. Specifically, the study was designed to identify:

a) the users of some of the most frequently used modeling systems,
b) the reasons for the selection of particular models,
c) the problems and successes of implementation,
d) user perceptions of the usefulness of models in decision-making and planning, and
e) user perceptions of the likelihood of future use of models in institutions of higher education.

Previous research efforts, most notably Gonyea (1971), Evans (1972), and Wartgow (1972), all dealt with a limited sample of a few institutions. The aim of the research reported on here was to survey all institutions that had access to CAMPUS (Comprehensive Analytical Methods for Planning in University/College Systems), HELP/PLANTRAN (Higher Education Long-Range Planning/Planning Translator), RRPM (Resource Requirements Prediction Model), and SEARCH (System for Evaluating Alternative Resource Commitments in Higher Education). A number of othemodels were not included in this study, such as CUP/AFMR (College and University Planning/American Foundation for Management Research), EDANAL (Education Analysis), GUS (General University System), HEPS (Higher Education Planning System), MAPS (Management and Planning Systems), and TEMPLAN (Temple Planning System). These and others were excluded because either they were no longer currently available or it was not possible to identify a sufficient number of experienced users.

Two questionnaires were developed to gather data separately from project leaders and financial and academic administrators. The purpose of using two questionnaires was to solicit independently the perceptions of users as well as implementers and to include persons holding diverse administrative positions within each institution. The first questionnaire (see Appendix A) requested information about the selection process, objectives, implementation problems, and current and future utilization. This questionnaire was sent to project leaders.[5]

The second questionnaire (see Appendix B) was directed to academic and financial administrators and focused on model-selection, objectives, and future utilization. The second questionnaire was shorter than the first, but contained only questions that also appeared in the first questionnaire. As a result, certain responses can be compared by groups (project leaders and academic and financial administrators).

Steps in Data Collection

The research effort began in October, 1974, and extended through August, 1975. Following is a description of the procedure used in

collection of the data:

1. A letter was sent to each of the agencies that supplied the models listed above asking them to provide a list of all institutions that had "access" to their respective systems. The word "access" is significant, since there was no assurance that institutions acquiring modeling systems were in fact using them.
2. The firms were also asked to identify each institution's project leader--the person in the institutions responsible for the implementation of the model or its operation once implemented.
3. A letter was sent to the persons identified by the suppliers selected asking them to respond to the questionnaire (Appendix A). They were also asked to identify the two academic and financial administrators at their institution who were most involved with the use of the model and were capable of assessing its usefulness.
4. A letter was sent to the two administrators at each institution identified by the project leader asking them to respond to an abbreviated questionnaire (Appendix B).

Findings

The findings are summarized in four parts. First, the results of the query to developers requesting identification of users are reviewed. Second, the responses from the mailing of the questionnaire to project leaders are reported and analyzed. Third, the responses from academic and financial administrators are examined and analyzed. Finally, the results of the comparison of both groups are reported.

Institutions with Access to Models Identified

Through the responses from model-developers, 394 institutions were identified as having access to one of the four modeling systems: 346 institutions from 45 states, the District of Columbia, and Puerto Rico; 43 Canadian institutions from seven provinces; and five foreign institutions representing four countries. The institutions are listed by model by state in Table 1. The total number of reported users of CAMPUS, PLANTRAN, and SEARCH (114) in 1975 represents a threefold increase since 1971,[6] when Wartgow identified 37 users of these same models. Information on the number of RRPM users in 1971 was not available.

A summary of institutions with access to these systems by institution type (the highest level of offering by country) is found in Table 2. Of the 394 institutions, 75 percent (296) are public and 25 percent (98) are private.

II. THE QUESTIONNAIRE TO PROJECT LEADERS

Representatives of 199 of the 394 institutions (50.5%) responded to the first questionnaire. The number and percentage of responses by model (Table 3) and by institution type (Table 4) closely approximates the distribution of the models as indicated at the end of Table 1 and in Table 2.

Of the responses, 73.4% were from public institutions and 26.6% (53) were from private institutions; the model-using population identified through the developers was 75 percent public and 25 percent private. The responses by state also satisfactorily represented the base population identified in Table 1. Responses were received from 108 insititutions in 42 states and the District of Columbia; 18 Canadian institutions in three provinces; and one foreign institution.

The distribution of responses by the respondents' job classifications is shown in Table 5. More than 60 percent of the responses are from either individuals associated with computer centers or offices of institutional research/analytical studies. This is not surprising, since the survey instrument was sent to persons identified as project leaders by the model developers. However, in several cases the respondent was someone other than the project leader.

The respondents were asked to identify the persons who initiated the search for the modeling system. The responses revealed that the percentage of initiators who occupied computer and institutional research positions was lower (23% vs. 60%) than that indicated by respondents. This is, nevertheless, significant, by virtue of their constituting the largest group, 12 percent and 11 percent respectively. Planning offices initiated the search in seven percent of the cases, and 37 percent of the respondents either did not know who initiated the search or did not respond. The low participation of academic administrators (5.5%) and financial administrators (8%) in initiating the search for a model lends credence to the contention often encountered in the literature that the impetus for acquiring analytical models tends to come from technical staff within the organization and not from administration.

A summary of the number of institutions utilizing the four models under study here appears in Table 6. The data might be somewhat confounded because the survey dealt only with the model currently being utilized; it is quite possible that some institutions later switched models or designed their own. This would account for such an institution's appearing on one vendor list while it is identified as the user of another model.

Of the 199 responses survey-wide, 21 were from institutions that did not implement a model, according to its representatives responding. Consequently, in the analysis of some responses, the total number of responses is given as N = 178. The responses of the 21 non-users were included, however, in the analysis of respondents' perceptions on the usefulness of models.

Implementation by Year

The responses to the question of which year the model was implemented are reported in Table 7. The 21 questionnaires specifying that

TABLE 1

INSTITUTIONS WITH ACCESS BY STATE AND MODEL

State	Total	CAMPUS	PLANTRAN	BRIM	SEARCH
Arkansas	1			1	
Alabama	4			3	1
Arizona	2			2	
California	12	1		11	
Colorado	9	5	1	3	
Connecticut	5	1		3	1
District of Columbia	4	1	1	2	
Florida	11			11	
Georgia	3			3	
Iowa	16		12	4	
Idaho	3			3	
Illinois	21		1	19	1
Indiana	8			7	1
Kansas	13		7	6	
Kentucky	6	2	1	3	
Louisiana	4			4	
Massachusetts	10	1		9	
Maryland	7			6	1
Maine	2	1		1	
Michigan	10			10	
Minnesota	4			3	1
Missouri	17		11	6	
Mississippi	2			2	
Montana	1			1	
North Carolina	22		17	5	
North Dakota	2			2	
Nebraska	6			6	
New Hampshire	1			1	
New Jersey	16	2		14	
New Mexico	3			3	
New York	28	2	3	20	3
Ohio	14	1		13	
Oklahoma	3			3	
Oregon	2			2	
Pennsylvania	23		1	22	
Rhode Island	5			5	
South Carolina	2		1	1	
South Dakota	4		1	3	
Tennessee	4			4	

TABLE 1 (cont'd)

State	Total	CAMPUS	PLANTRAN	IRON	SEARCH
Texas	8			8	
Utah	3			3	
Virginia	6	1		5	
Vermont	1			1	
Washington	4			4	
Wisconsin	10	4	1	5	
West Virginia	2	—	—	2	—
U.S. Total	344	22	58	255	9
Canada	43	24	1	18	
Puerto Rico	2			2	
Foreign	5	—	—	5	—
Other Total	50	24	1	25	
TOTAL	394	46	59	280	9
Percentage	100	12	15	71	2

TABLE 2

INSTITUTIONS WITH ACCESS BY HIGHEST LEVEL OF OFFERING*

	Total	2 but less than 4 years	4- or 5-year baccalaureate degree	Master's degree	Beyond master's but less than doctorate	Doctorate	Boards, Commissions, or Ministry
United States	344	83	45	48	32	121	17
Canada	43	21				19	2
Puerto Rico	2					2	
Foreign	5	—	—	—	—	2	1
TOTAL							
Numbers	394	104	45	48	32	144	22
Percentage	100	26	11	12	8	37	6

*Highest Level of Offering is taken from the Education Directory 1973-74, by Hazel C. Poole, Washington: U. S. Office of Education, p. XXIII. A category was added to code State Agencies, Boards, Commissions or Ministries.

TABLE 3

RESPONSES BY MODEL

	Number of Responses	Number Sent	Percent	% of Initial Group	Percent of Total Responses
CAMPUS	30	46	65	12	15
PLANTMAN	29	59	49	15	14.5
RSPA	135	280	48	71	68
SEARCH	5	9	55	2	2.5
TOTAL	199	394	50.5	100	100.0

TABLE 4

RESPONSES BY INSTITUTION TYPE

Institution Type	Percentage	Number of Institutions
2 but less than 4 years	25.6	51
4 or 5 year baccalaureate degree	10.55	21
Master's Degree	11.6	23
Beyond master's but less than doctorate	10.55	21
Doctorate	36.7	73
Boards, Commissions or Ministry	5.0	10
TOTAL	100.0	199

TABLE 5

RESPONDENTS BY JOB CLASSIFICATION

Job Code*	Total n	Total %	CAMPUS n	CAMPUS %	PLANTWIDE n	PLANTWIDE %	RSPM n	RSPM %	SEARCH n	SEARCH %
01 Presidents	3	(1.5)	3	(10.0)						
02 Academic Administrator	17	(8.5)	3	(10.0)	1	(3.4)	13	(9.6)		
03 Business Officer	21	(10.6)	3	(10.0)	4	(13.8)	11	(8.1)	3	(60.0)
04 Development Officer	2	(1.0)			1	(3.4)	1	(0.7)		
06 Planning Officer	27	(13.6)	9	(30.0)	5	(17.2)	11	(8.1)	2	(40.0)
44 Computer Center Personnel	68	(34.2)	9	(30.0)	6	(20.7)	53	(39.3)		
47 Institutional Studies	52	(26.1)	2	(6.7)	9	(31.0)	41	(30.4)		
58 Assistant to the President	3	(1.5)			2	(6.9)	1	(0.7)		
64 Registrar	2	(1.0)					2	(1.5)		
Miscellaneous	2	(1.0)	1	(3.3)	1	(3.4)				
Unknown	2	(1.0)					2	(1.5)		
Total	199		30		29		135		5	

*The job codes utilized were taken from the Education Directory 1973-74, Appendix M. pp. 539-544. Respondents were categorized into the group most representative of their function based on their description of their jobs.

TABLE 6

USERS BY MODEL

Identified by Vendors as Users of

Model in Use	CAMPUS	PLANTRAN	RSTM	SEARCH	Total in Use
CAMPUS	29		2		31
PLANTRAN		18	6		24
RSTM		4	103	1	108
SEARCH			1	4	5
Other			10		10
Not Specified	1	7	13		21
Total of original groupings percentage	30	29	135	5	199

TABLE 7

YEAR OF IMPLEMENTATION BY MODEL UTILIZED

	CAMPUS	PLANTRAN	RHM	SEARCH	Other	Total	Percentage
No Response	5	13	25	1	3	47	
1969	1					1	.8
1970	4		1			5	3.8
1971	4	2	2	1	3	12	9.2
1972	2	3	11	1	1	18	13.7
1973	5	4	19			28	21.3
1974	1	1	22		3	27	20.6
1975	7	1	11	1		20	15.3
In Process	2		17	1		20	15.3
Total	31	24	108	5	10	178	100.0
Percentage	17.4	13.5	60.7	2.8	5.6	100	

none of the models in use were excluded.

The trend indicated in reviewing the total implementations by year is definitely upward.

Approximately one percent of the models were implemented in 1969; 21 percent were implemented in 1973 and 1974. These data were collected in mid-1975 and, assuming the implementations in process were completed by the end of the year, this would result in a total of 40 (30.6%) implementations in 1975.

Viewed graphically in Table 8, a clear upward trend emerges. The slope of the line could alter if the graph were smoothed out, but there is little doubt that there has been a multifold increase in the number of institutions implementing models, and current activity remains high. This table also depicts the growth of model usage by public and private institutions. The increase in utilization by public institutions has closely paralleled the overall growth in the use of models. On the other hand, private institutions started utilizing models later and have shown a more moderate growth pattern.

Two-year institutions were the early users of modeling techniques and boards of higher education and coordinating commissions were the last to begin utilizing models. The early participation of two-year institutions (5 out of 6 users in 1969 and 1970) can be directly traced to the use of CAMPUS by the two-year institutions in Ontario. Of the six boards and commissions responding, all began using models after 1973.

It might be assumed that the selection of such a modeling system entails a systematic process that begins with a statement of objectives, sets forth benchmarks for evaluation, and perhaps even establishes an evaluation process. Apparently, this is not the case, since 73 (57%) of the 128 respondents answered negatively to the question of whether or not a statement of objectives that the model was to serve was prepared. Further, 96 respondents (75%) said an individual, and not a committee or a consultant, made the decision to acquire the model. The words of one respondent seem to speak for the prevailing sentiment: "I just decided to install it, and try it."

Project Leaders' Objectives

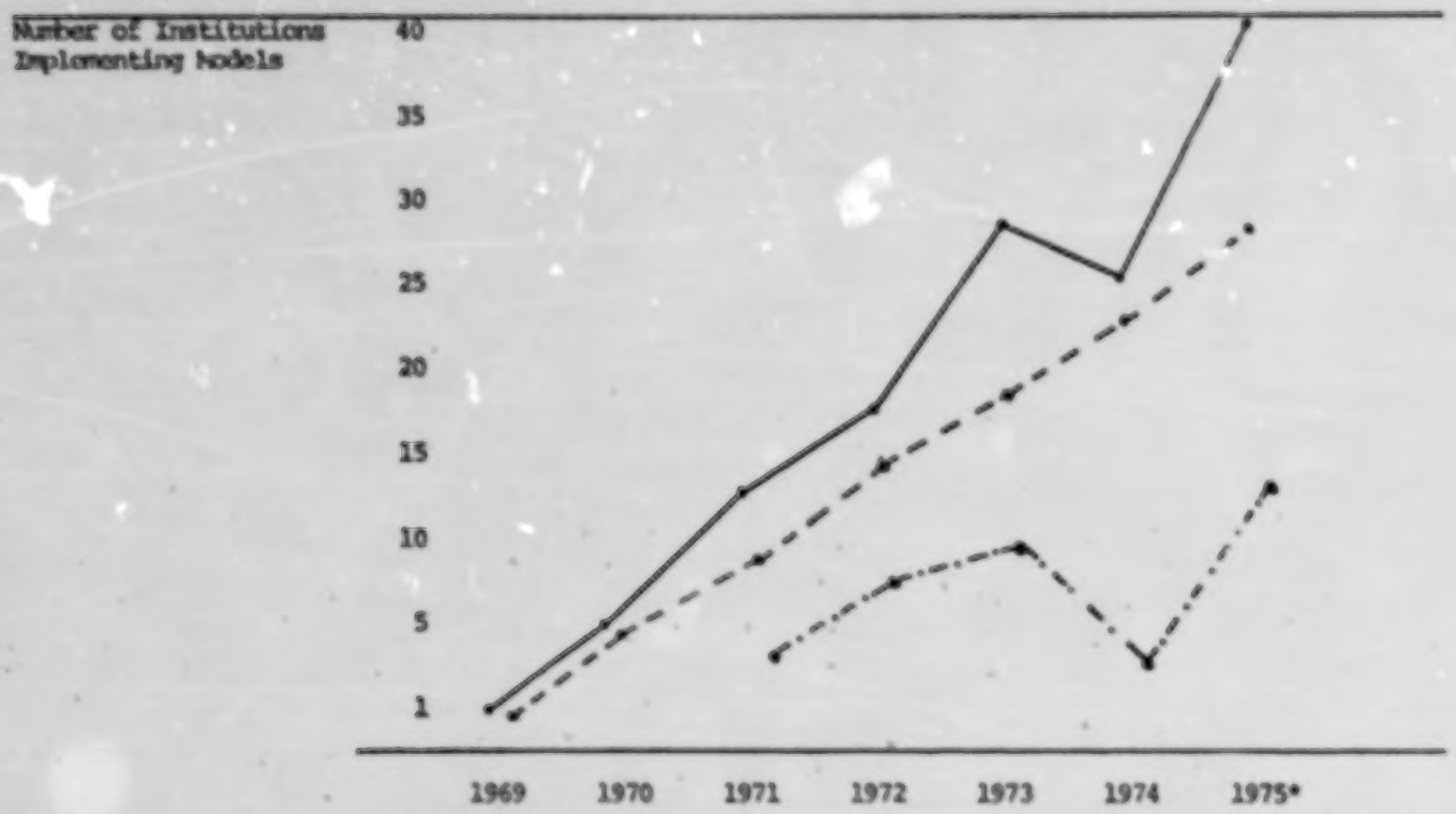
The assumption that models are used more frequently as a long-range planning tool than for day-to-day decision-making was supported.

The respondents were asked to identify the three most important objectives to be satisfied by the implementation of the model. Table 9 shows that 36 (29%) of the 123 respondents to this question identified the need for a forecasting ability as the single most important objective (Rank 1). Twenty-two persons (17.9%) said the production of more useful data, either for day-to-day institutional management or for the allocation of increasingly scarce resources, was the prime objective.

Analysis of these objectives by the public/private classification of the institution indicates that the need for a forecasting ability ranks first for both public (25.6%) and private (39.4%) institutions. Private institutions ranked the requirement for more useful data for day-to-day management as the second objective (27.4%), and public institutions identified the need for better data to allocate increasingly

TABLE 8

GRAPH OF MODEL IMPLEMENTATION BY YEAR



* Including those systems in the process of implementation as of June 1975.

_____ All Institutions ———— Public Institutions -·-·-·- Private Institutions

TABLE 9

OBJECTIVES TO BE SERVED BY THE MODEL

	N = 123	Rank 1 n %	Rank 2 n %	Rank 3 n %
1.	Requirement for more useful data for day-to-day institutional management	22 (17.9)	9 (7.4)	8 (6.7)
2.	Internal political requirement	3 (2.4)	2 (1.6)	5 (4.2)
3.	External political requirement	15 (12.2)	7 (5.7)	10 (8.2)
4.	Need for forecasting ability (consideration of alternatives)	36 (29.3)	31 (25.4)	22 (18.5)
5.	Need for integration of institutional data	10 (8.1)	24 (19.7)	27 (22.7)
6.	Better data required to react to external queries	9 (7.3)	16 (13.1)	14 (11.8)
7.	Better data required to allocate increasingly scarce resources	22 (17.9)	30 (24.6)	31 (26.1)
8.	Other	6 (4.9)	3 (2.5)	2 (1.7)
	Total	123	122	119

TABLE 10

REASONS WHY MODEL WAS SELECTED

	Rank 1 n	Rank 1 %	Rank 2 n	Rank 2 %	Rank 3 n	Rank 3 %
1. Ease of use on a continuing basis	10	(7.6)	11	(9.3)	7	(5.9)
2. Low acquisition cost	35	(26.5)	23	(19.3)	23	(19.5)
3. Seemingly low operating costs	1	(.1)	5	(4.2)	9	(7.6)
4. Sophistication of the model	9	(6.8)	3	(2.5)	11	(9.3)
5. Reports output	8	(6.1)	11	(9.3)	15	(12.7)
6. Flexibility of input	4	(3.0)	3	(2.5)	6	(5.1)
7. Promise of external support	3	(2.3)	10	(8.4)	3	(2.5)
8. Availability of external funds	5	(3.8)	9	(7.6)	1	(.1)
9. Ease of initial implementation	10	(7.6)	18	(15.1)	10	(8.5)
10. Supported by existing computer equipment	7	(5.3)	13	(10.9)	15	(12.7)
11. Key administrators wanted it	18	(13.7)	4	(3.4)	13	(11.0)
12. Other	22	(16.7)	9	(7.6)	5	(4.2)
Total	132		119		118	

scarce resources as their second objective. The higher ranking of the requirement for more useful data for day-to-day management is perhaps a reflection of the financial plight of private colleges. Surprisingly, item 7 (allocating scarce resources) was ranked lower by the private than the public institutions.

Choice of Particular Model and Implementation

While cost is a major factor in the selection of a model, the data cannot support this as the only important factor; administrators' desire to use a model, ease of implementation and continuing use, and the model's level of sophistication are also important.

The responcents were asked to rank in order of importance the three reasons they selected the specific model they did. An examination of Table 10 reveals that of the 132 who responded, 26.5 percent identified low acquisition cost as the most important reason (Rank 1) for the model's having been acquired. The fact that key administrators wanted to implement the model was ranked first in 13.7 percent of the responses. Ease of initial implementation and of use on a continuing basis, and sophistication of the model were the other reasons most frequently given (6 - 7%).

The fact that RRPM can be acquired for the cost of reproducing the software while the others cost thousands of dollars may have influenced the above data. For this reason, some analysis of the responses by the model used was performed. The three major reasons that the 25 users of CAMPUS gave for selecting the model were sophistication of the model, availability of external funds and the fact that it was imposed on them by another group (i.e. boards, commissions or ministries). Each of these was ranked first on 16 percent of the responses. The sixteen PLANTRAN users responding checked low acquisition cost in 43.8 percent of the cases and ease of initial implementation in 18.8 percent. As we suspected, low acquisition cost was the prime reason that RRPM was acquired. Thirty-one percent of the 87 RRPM users responding ranked this first; 16.1 percent said they selected it because key administrators wanted it. Fifty percent of the SEARCH users selected the model because of its ease of use on a continuing basis.

Only 26 percent of the respondents said their institutions created an organizational unit to implement the model, but this is not indicative of the level of commitment required to support modeling. Only 50 respondents chose to indicate how many persons worked on implementation, but even that number indicates a commitment of resources. Of those, 20 percent said that one person worked on the project; 48 percent said that there were two or three, and 32 percent said four or more people were assigned to the project.

Asked whether their institutions had established a process to evaluate implementation, 56 of 129 respondents (43.4%) said "yes." Of those, 73 percent said the evaluation was done periodically as opposed to in one final assessment.

Ninety-four (47%) respondents said the use of the model was considered a pilot project at their institution. Forty (20%) said that it was not a pilot project and sixty-five (33%) did not respond. These data suggest that an evaluation actually was being performed, although a formal

evaluation process had not been established.

Respondents from 39 institutions said the model had not been utilized since the original implementation. This count, together with the 21 respondents who had access to a model but were not using it (noted in Table 6), represents a significant percentage (30) of the total respondents. The high percentage seems to indicate dissatisfaction with the model on the part of these institutions.

Viewing these data from another perspective, however, the fact that only 20 percent did not utilize the model after completion of the pilot project could be taken as indicative of a high degree of satisfaction. Unfortunately, it is not known whether there were plans originally to use the model beyond the pilot-project period, but it is rather doubtful that institutions would expend the time and money on a model and not have plans for its continued use.

The Role of Consultants

The role of consultants in computer-related endeavors has been much maligned; consultants have sometimes been accused of creating a need, much as defense contractors influence the needs and desires of the military establishment. Twenty-nine percent of the institutions required the assistance of consultants in some capacity to assist in implementation. Of those utilizing consultants, nearly 90 percent said the consultant's role was in assisting implementation, and 66 percent (multiple responses were possible) said it was in staff training. In 28 percent of the cases the consultants implemented the system, and in 25 percent consultants maintained the system on a continuing basis.

Some researchers have suggested that institutions are implementing models because funding has been available, and not necessarily because models were perceived as crucial to better management. Sixty- two persons (64%) of the 97 responding to this question believed that the model currently in use would have been selected whether or not funds had been available from an outside source. This represents a clear majority, but the fact that 35 institutions (36% of the responses) would not have implemented the model is significant. Of these, 16 said that 100 percent of the funds were received from outside sources. Assuming the sample is representative of all 394 institutions with access to a model, it would represent a significant number of institutions (141). Without outside funding, some of these institutions might have selected a less costly model or approach. Additional research in this area would assist in determining the true commitment of institutions to the use of analytical models.

The amount of time required to implement the system was reported to have been one year or less by 76 (71.0%) of the 107 users who responded to this question. Thirty-eight (35.5%) stated that it took three months or less to get the system operational and 17 users (15.7%) said it took two to three years.

Cost overruns have not been uncommon in computer projects and one aim of this research was to gather some hard data on modeling costs from the standpoints of both initial investment and continued cash flow. The total costs of implementation (software, people and computer time) are illustrated in Table 11 along with the annual operating costs. While

the data presented in this table suggest that a financial expenditure is required, more precise data could have been collected with a more carefully designed survey instrument. Clearly, the high response in the 0 - $25,000 range leaves one with the need to know the actual distribution within that range and the mean costs of all institutions reporting. This is especially true of operating costs, since these should be lower than initial start-up costs.

TABLE 11

IMPLEMENTATION AND OPERATING COSTS

	Implementation Costs		Operating Costs	
	Number	Percentage	Number	Percentage
0 - $25,000	83	70.9	93	86.9
$25,001 - $50,000	9	7.7	8	7.5
$50,001 - $75,000	9	7.7	4	3.7
$75,001 - Up	16	13.7	2	1.9
Total	117	100.0	107	100.0

III. COMPARISON OF DATA: ADMINISTRATORS AND PROJECT LEADERS

The remainder of the data collected from project leaders dealt with their perceptions of the usefulness of models, the problems and successes encountered, and the prospects for model-use both at their institutions and in higher education in general. These data were also collected in a second questionnaire to administrators and will be analyzed with the project leaders' responses following a description of the data collection process followed for this second questionnaire.

Survey of Academic and Financial Administrators

The project leaders (respondents to the first survey) were asked to identify the financial and academic administrators at their institutions who were most involved with the use of the model and were capable of assessing its usefulness. One hundred and two of the 199 project leaders responding (51.5%) named at least one administrator. Significantly, 97 of the respondents (48.7%) did not identify any administrators whom they felt could comment on the usefulness of the model.

A total of 143 academic and financial administrators were identified, and the second questionnaire (Appendix B) was mailed to them as responses were received from project leaders.

Seventy-one administrators responded, constituting a return of 49.7 percent--within one percent of the 50.5 percent return on the first mailing.

The summary of the responses by model, presented in Table 12, closely approximates the distribution in the first mailing indicated in Table 3. The response by institution type was not significantly different from that indicated in Table 4 for the first questionnaire.

The goal of the second mailing was to solicit the perceptions of non-technical persons on a series of questions concerning their experience with the model and the applicability of analytical models to higher education administration. Of the respondents, 60.6 percent were either chief academic or financial officers, and another 2.8 percent were presidents (Table 13).

Responses According To Classification

The persons using the model in its early stages (project leaders) do not consider the model more successful than do administrators. Although significant variance did not exist among most responses, in the two cases where a significant variance did exist it was the administrators rather than the project leaders who had a higher mean acceptance score.

One of the assumptions of this study was that project leaders would register more favorable comments than administrators would concerning the institution's experience with models, the likelihood of future use, and the other variables considered. The response means for 11 questions addressed to both project leaders and administrators are listed in

TABLE 12

	Number Of Responses	Number Sent	Percent	Percent Of Initial Group	Percent Of Total Response
CANTUS	15	24	62.5	16.8	21.1
PLAINTIAN	11	17	64.7	11.9	15.5
RHYM	44	100	44.0	69.9	62.0
SEARCH	1	2	50.0	1.4	1.4
TOTAL	71	143	49.7	100.0	100.0

TABLE 13

JOB CLASSIFICATION OF RESPONSES TO SECOND QUESTIONNAIRE

Job Description	CAMPUS	PLANTATION	BRENTWOOD	SEARCH	Total n	%
01 President			1	1	2	(2.8)
02 Chief Academic Officer	6	5	7		18	(25.4)
03 Chief Business Officer	6	3	16		25	(35.2)
04 Chief Development Officer		1			1	(1.4)
06 Chief Planning Officer	1		4		5	(7.0)
44 Director Computer Center		1	1		2	(2.8)
47 Director Institutional Studies	1		11		12	(16.9)
58 Assistant to President			1		1	(1.4)
64 Registrar			1		1	(1.4)
Faculty	1	1	2		4	(5.6)
Totals	15	11	44	1	71	

Table 13A. Note that for each of the questions the mean for administrators was slightly higher than for project leaders. This variance has been deemed significant in only two of these variables, namely, satisfaction of initial objectives and the value of models for decisions the respondents must make in their positions in the institution. The comparison of means was done by virtue of t-tests; the t-square was calculated to determine if there was a significant variance between project leaders and administrators when all of the questions are considered. The result of this calculation (listed at the bottom of Table 13A) indicated that there wasn't a significant difference between these two groups. Consequently, the assumption that project leaders do indeed find models more usefu' and thus have had more successful experiences with their use must be rejected.

The following analysis deals with both groups of respondents: the project leaders (n=199) and academic/financial administrators (n=71). There is considerable overlap in job function between the respondents in these two groups and for this reason the responses will be analyzed as one group (n=270) as well as by individual groups.

One of the assumptions underlying this research was that there was a relationship between an individual's job function and his or her perception of the usefulness and applicability of models to higher education management. For this reason, a number of analyses were performed to determine whether such a relationship did indeed exist. Another assumption was that the particular model used would have a significant impact on the respondents' perceptions on this same series of questions, and appropriate tests were also performed to determine whether such a relationship existed. In the interest of brevity, only those tables that resulted in a significant relationship between job classification or model used will be included throughout the remainder of this report.

Satisfaction Of Objectives

The main assumption--that few institutions feel they have satisfied a considerable number of their objectives and thus consider the use of a model a failure--is supported.

The mean acceptance score on both the questions dealing with satisfaction of initial objectives and success/failure is closer to the category of "somewhat successful" (weight 2) than to that of "a high degree of success" (weight 3). The mean acceptance score is between 2.083 and 2.451; since the median score of 2.5 was not achieved, it can hardly be said that model-use has been a success.

One of the major goals of this study was to determine the extent to which original objectives were satisfied by the use of models since we assumed there was little demonstrable success in model use and that there were discernible reasons for the failures. The responses to the question of whether objectives had been satisfied through the use of the model are presented in Table 14. Interestingly, the mean acceptance score was higher for administrators than for project leaders but the Chi-Square indicates that statistically, there is no significant difference between the responses of the two groups, since the probability that this

TABLE 13A

COMPARISON OF MEANS BY RESPONDENT

Description of Question	Project Leaders n	Project Leaders Mean	Administrators n	Administrators Mean
Disposition to change	136	2.529	61	2.721
Initial objectives satisfied	110	2.227	62	2.451
Administrative decisions based on modeling	118	1.889	64	1.984
Highest level at which model used	101	3.148	59	3.152
Information for day-to-day management	114	2.105	61	2.229
Information for long-range planning	114	2.473	62	2.596
Integration of model with data processing	117	2.282	63	2.317
Models contribute to managing	135	2.977	66	3.000
Success/Failure	120	2.083	61	2.196
Value for respondent decisions	119	2.470	63	2.730
Likelihood of use	131	2.977	65	3.076

Mahalanobis D Square .2347

Hotelling t-square 9.0503

Degrees of freedom 11,157

P = .670

TABLE 14

INITIAL OBJECTIVES SATISFIED

Weight	Description	Project Leaders n	%	Administrators n	%
1	None	16	(14.6)	4	(6.5)
2	Some	58	(52.7)	29	(46.8)
3	A considerable number	31	(28.2)	26	(41.9)
4	All	5	(4.5)	3	(4.8)
	Total - n = 172	110		62	
	Mean	2.227		2.451	
	Standard Deviation	0.750		0.693	

Chi-Square 4.782 with 3 degrees of freedom P = .19

distribution of responses could have occurred by chance is .19.

The analysis of responses by job classification did not yield any significant relationship; however, one noteworthy fact is that 80 percent of the presidents, 52.4 percent of academic administrators and 46.7 percent of the business officers said a considerable number or all of the initial objectives had been satisfied. This is in contrast to 31.6 percent, 28.2 percent and 35.9 percent for planning officers, computer center personnel and persons involved in institutional studies.

The mean acceptance scores by model (on a scale of 1 to 4, with 4 being "all objectives satisfied") were as follows: CAMPUS = 2.142; PLANTRAN = 2.333; RRPM = 2.257; and SEARCH = 1.750. Except in the case of SEARCH, which had a considerably lower acceptance mean, testing of the variance did not result in any significant differences by model. Only the responses of the project leaders were used in this table, because inclusion of the administrators' responses would have biased the results with multiple responses from some institutions. The model groupings exclude the 21 responses indicating no model was in use. Institutions that have developed their own model were also excluded. Subsequent analyses of responses by model will also exclude the responses of the second questionnaire. Calculation of the mean of all 172 responses to the question of satisfaction of objectives resulted in a score of 2.308. Considering the weighted scale of 1 to 4 with 2.5 as the median, it can hardly be said that objectives were met with resounding success.

As a means of verifying the responses to the question on satisfaction of objectives, the respondents were also asked to what extent they considered the use of the model a success or failure at their institution. The responses are reported in Table 15. As was the case with satisfaction of objectives, the mean acceptance was slightly higher for administrators than it was for project leaders, but the statistical measure indicates that there isn't a significant variance between the two groups.

Only 26.2 percent of the administrators and 24.1 percent of the project leaders felt that the model was highly successful or an overwhelming success. This is in contrast to 45.7 percent of the administrators and 32.7 percent of the project leaders who indicated that a considerable number or all of the initial objectives had been satisfied. The job classification of the respondents was not a significant factor in their responses.

The response means by model on the question of success or failure were as follows: CAMPUS = 1.956; PLANTRAN = 1.941; RRPM = 2.171; and SEARCH = 1.750. This is somewhat lower than the means reported for satisfaction of initial objectives and indicates that even though the objectives were satisfied, the use of the model was still considered unsuccessful. The variance in the response means by model is not significant, however.

Examination of the relationship between the year of implementation and the extent to which the initial objectives were satisfied did not yield any significant results. It is notable, however, that 20 of the 34 persons indicating that all or a considerable number of the objectives were satisfied had implemented their models since January 1, 1973.

In summary, although the respondents' views of success/failure and satisfaction of objectives do not reflect complete confidence in the use of models, it is significant that 36 percent (65 out of 182) of all

TABLE 15

MODEL SUCCESS/FAILURE

Weight	Description	Project Leaders n	%	Administrators n	%
1	A dismal failure	20	(16.7)	4	(6.6)
2	Somewhat successful	71	(59.2)	41	(67.2)
3	Highly successful	28	(23.3)	16	(26.2)
4	An overwhelming success	1	(0.8)	0	
	Total - n = 181	120		61	
	Mean	2.083		2.196	
	Standard Deviation	0.655		0.542	

Chi-Square 4.188 with 3 degrees of freedom P = .25

t (Pooled) 1.19 with 178 degrees of freedom P = .237

respondents said that all or a considerable number of objectives had been satisfied, and 25 percent (45/181) felt that the model was a success. Conversely, the fact that these percentages are substantially less than 50 is indicative of a high degree of dissatisfaction. It is unfortunate that historical data are not available to determine if degree of satisfaction has increased over the years. Further research comparing the result of this study with new data gathered at different time intervals would seem appropriate.

Decision-Making

The most important perceived institutional need for the use of a model is the need for forecasting ability. The survey results show models are used more frequently as long-range planning tools than for day-to-day decision-making.

The use of models (or their outputs) as aids in making administrative decisions was another variable to be tested by the survey. The questionnaire posed this question in two ways. First, the respondents were asked to what extent administrative decisions are based on the results of modeling. This was followed by a request that they identify the highest level at their institution that has consciously used the model in making any decisions. It seems clear from the results on Table 16 that there is not an over-reliance on models as aids in decision-making.

The assumption that models are used more at the middle-management level must be discarded; the data indicate that models are used at the highest level of the organization more frequently than at the intermediate level.

The presidential level was reported to be the highest level consciously using the model for making any decisions by 40.6 percent of the project leaders and 39 percent of the administrators. As shown in Table 17, the higher the level of administration, the more likely it is the model will be used. The summary of the responses by job code is found in Table 18. The Chi-Square of 54.409 results in a probability of less than .05, suggesting there is a significant difference between the distribution of responses based on job code. Presidents and academic administrators both identified the presidential level as the highest level using the model in a majority of the cases (100% and 59% respectively). At the other extreme, 26.5 percent of the computer center personnel said middle management was the highest level using the model.

Pursuing the assumption that different models might be more suitable (by design or otherwise) for upper levels of management, the data were summarized by model and the analysis indicated there is no significant difference in the level of use based on the particular model used.

The purpose of the information generated by the model, whether it be for day-to-day management or long-range planning, was also of concern. The assumption was that models are not extensively used for day-to-day management but are used primarily as long-range planning tools. To this end, the respondents were asked whether the model makes available useful information for day-to-day management or long-range planning.

As indicated in Table 19, 74 percent of the project leaders and 64 percent of the administrators said that no useful information or some useful information for day-to-day management was available as a result of the model's use.

TABLE 16

ADMINISTRATIVE DECISIONS BASED ON THE RESULTS OF MODELING

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	None	31	(26.3)	12	(18.9)
2	Some	69	(58.5)	41	(64.1)
3	A considerable number	18	(15.2)	11	(17.2)
4	All	0		0	
	Total	118		64	
	Mean	1.889		1.984	
	Standard Deviation	0.637		0.604	

Chi-Square 1.305 with 3 degrees of freedom
P = .730

TABLE 17

HIGHEST LEVEL USING THE MODEL FOR DECISION-MAKING

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	Operational	4	(4.0)	4	(6.8)
2	Middle Management	18	(17.8)	6	(10.2)
3	Vice-Presidents	38	(37.6)	26	(44.1)
4	Presidents	41	(40.6)	23	(39.0)
	Total	101		59	
	Mean	3.148		3.152	
	Standard Deviation	0.853		0.867	

Chi-Square 2.456 with 3 degrees of freedom
P = .40 < .50

TABLE 18

HIGHEST LEVEL USING THE MODEL IN DECISION-MAKING BY JOB CODE

Job Code	Description	1 Operational n	%	2 Middle Management n	%	3 Vice-Presidents n	%	4 President n	%
01	President							4	(100.0)
02	Academic Administrator			2	(9.1)	7	(31.8)	13	(59.0)
03	Business Officer	2	(6.5)	4	(12.9)	11	(35.5)	14	(45.2)
06	Planning Officer	1	(5.3)	2	(10.5)	10	(52.6)	6	(31.6)
44	Computer Center Personnel	1	(2.9)	9	(26.5)	7	(20.6)	17	(50.0)
47	Institutional Studies	2	(5.0)	6	(15.0)	25	(62.5)	7	(17.5)
58	Assistant to the President					2	(50.0)	2	(50.0)
64	Registrar			1	(100.0)				
65	Faculty	2	(50.0)			2	(50.0)		
	Total - n = 159	8	(5.0)	24	(15.1)	64	(40.3)	63	(39.6)

Chi-Square 54.409 with 33 degrees of freedom
P < .05

These data were also analyzed by job code and the model used. The results showed there wasn't any significant difference among the responses that might have been attributed to a respondent's job code or the model utilized.

The respondents' perceptions of the availability of more useful information for long-range planning are presented in Table 20. Once again, statistical analysis of the responses by job code and model used did not result in a significant variance.

Reviewing the response mean of project leaders and administrators on the question of availability of information for day-to-day management and long-range planning, we find a marked difference in the responses. Both groups rated information for long-range planning higher, so it seems reasonable to conclude that models at their present state of development are more useful as long-range planning tools than as tools for day-to-day management. This coincides with the respondents' views reported earlier (Table 9) that the single most important objective in implementing the model was the need for a forecasting ability (consideration of alternatives).

Integration and Perceived Value of Models

The assumption that models are not integrated with institutional data collection was supported by the findings in this study.

The extent to which the model is integrated with institutional data collection is reported in Table 21. The Chi-Square of 9.661 results in P being in the range of .025 and .01, indicating a significant variance between the responses of the project leaders and administrators. Considerably more project leaders found themselves in the extreme positions, indicating that the model was either not at all integrated or was completely integrated.

Analysis of the responses to the question of data integration by job code and model indicated that a significant variance did not exist. However, the question may have been biased, because it presumes that all of the models in this study have been designed with integration in mind.

In response to the question of whether or not the models can contribute substantially to assisting in managing an institution of higher education, an overwhelming majority of project leaders (82.2%) and administrators (78.8%) said that models either can contribute greatly or are an absolute necessity (Table 22). These figures indicate that the respondents have a degree of confidence much higher than the degree of actual success they experienced with their own models.

The respondents were also asked to identify the value of the models they used for making the kind of decisions necessary in their own staff positions. In reviewing the findings reported in Table 23, we find that 47.1 percent of the project leaders and 51.9 percent of the administrators said that models were very valuable or extremely valuable for the decisions that they must make.

The question of the value of modeling to the respondent in his or her position was one question whose response was expected to vary with the position occupied. This is borne out by the data in Table 24 and the resultant Chi-Square. This table shows that the mean acceptance scores for computer center personnel, assistants to the president,

TABLE 19

INFORMATION FOR DAY-TO-DAY MANAGEMENT

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	None	28	(24.6)	11	(18.0)
2	Some	56	(49.1)	28	(45.9)
3	Much More	20	(17.5)	19	(31.1)
4	An Extensive Amount	10	(8.8)	3	(4.9)
	Total - n = 175	114		61	
	Mean	2.105		2.229	
	Standard Deviation	0.876		0.804	

Chi-Square 4.940 with 3 degrees of freedom
P .15 < .20

TABLE 20

INFORMATION FOR LONG-RANGE PLANNING

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	None	17	(14.9)	3	(4.8)
2	Some	41	(36.0)	24	(38.7)
3	Much More	41	(36.0)	30	(48.4)
4	An Extensive Amount	15	(13.1)	5	(8.1)
	Total - n = 176	114		62	
	Mean	2.473		2.596	
	Standard Deviation	0.904		0.711	

Chi-Square 6.121 with 3 degrees of freedom
P = .11

TABLE 21

INTEGRATION OF MODEL WITH INSTITUTIONAL DATA COLLECTION AND PROCESSING

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	Not at all	29	(24.8)	8	(12.7)
2	Somewhat	38	(32.5)	28	(44.4)
3	Considerably	38	(32.5)	26	(41.3)
4	Completely	12	(10.2)	1	(1.6)
	Total - n = 180	117		63	
	Mean	2.282		2.317	
	Standard Deviation	0.954		0.714	

Chi-Square 9.661 with 3 degrees of freedom
P .01 < .025

TABLE 22

VALUE OF MODELS FOR ASSISTING IN MANAGING INSTITUTIONS OF HIGHER EDUCATION

Weight	Description	Project Leaders n	%	Administrators n	%
1	Not at all	1	(0.8)	0	
2	Somewhat	23	(17.0)	14	(21.2)
3	Can Contribute greatly	89	(65.9)	38	(57.6)
4	An absolute necessity	22	(16.3)	14	(21.2)
	Total - n = 201	135		66	
	Mean	2.977		3.000	
	Standard Deviation	0.604		0.656	

Chi-Square 1.995 with 3 degrees of freedom
P = .60

t (Pooled) .24 degrees of freedom 198 P = .814

faculty, registrars and physical-plant directors are considerably lower than for the other job descriptions. It is not surprising that presidents, academic administrators, business officers, planning officers and persons involved in institutional research--the people responsible for planning and budgeting--would find models more useful.

TABLE 23

VALUE OF THIS MODEL FOR DECISIONS
RESPONDENT MUST MAKE AT THEIR INSTITUTIONS

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	Not at all valuable	15	(12.6)	2	(3.2)
2	Somewhat valuable	48	(40.3)	22	(34.9)
3	Very valuable	41	(34.5)	30	(47.6)
4	Extremely valuable	15	(12.6)	9	(14.3)
	Total - n = 182	119		63	
	Mean	2.470		2.730	
	Standard Deviation	0.871		0.745	

Chi-Square 6.154 with 3 degrees of freedom
P = .10

t (Pooled) 2.09 degrees of freedom 179 P = .038

TABLE 24

VALUE OF THIS MODEL FOR DECISIONS THE RESPONDENT MUST MAKE AT THEIR INSTITUTION BY JOB CODE

Job Code	Description	1 Not At All Valuable n	%	2 Somewhat Valuable n	%	3 Very Valuable n	%	4 Extremely Valuable n	%
01	President	1	(20.0)	1	(20.0)	2	(40.0)	1	(20.0)
02	Academic Administrator	1	(4.2)	6	(25.0)	12	(50.0)	5	(20.8)
03	Business Officer	1	(2.9)	11	(31.4)	18	(51.4)	5	(14.3)
06	Planning Officer			8	(36.4)	8	(36.4)	6	(27.3)
44	Computer Center Personnel	13	(30.2)	24	(55.8)	5	(11.6)	1	(2.3)
47	Institutional Studies			13	(31.0)	23	(54.7)	6	(14.3)
50	Director Physical Plant			1	(100.0)				
58	Assistant to the President			2	(50.0)	2	(50.0)		
64	Registrar			1	(100.0)				
65	Faculty	1	(25.0)	3	(75.0)				
	Total - n = 181	17	(9.4)	70	(38.7)	70	(38.7)	24	(13.3)

Chi-Square 65.286 with 33 degrees of freedom
P < .001

IV. PROSPECTS FOR FUTURE USE

The final two questions dealt with future prospects. First, the respondents were asked the likelihood that their model or any other model will be used for planning and decision-making in their institution. Second, they were asked whether, in light of their experience, the use of models in higher education administration should be fostered.

Likelihood Of Use

The responses on likelihood of use are presented in Table 25. The acceptance mean of 2.9777 and 3.076 for project leaders and administrators respectively seems to indicate there is a good possibility that models will continue to be used. Over 70 percent of project leaders and 78.5 percent of the administrators said there was a good possibility or a virtual certainty that models would be used at their institutions.

Should Use of Models Be Fostered?

The second question--whether the use of models should be fostered--brought an overwhelming positive response, as shown in Table 26. The percentage of positive responses for the two groups (project leaders and administrators) is virtually identical, so it is not surprising that the Chi-Square indicated no significant difference between the two groups. A considerable number (133) of respondents did qualify their positive responses with extensive statements about the future direction that developments should take.

TABLE 25

LIKELIHOOD OF ANY MODEL BEING USED AT YOUR INSTITUTION

Weight	Description	Project Leaders n	Project Leaders %	Administrators n	Administrators %
1	No possibility	3	(2.3)	1	(1.5)
2	Some possibility	36	(27.5)	13	(20.0)
3	Good possibility	53	(40.4)	31	(47.7)
4	Virtual certainty	39	(29.8)	20	(30.8)
	Total - n = 196	131		65	
	Mean	2.977		3.076	
	Standard Deviation	0.817		0.756	

Chi-Square 1.637 with 3 degrees of freedom
P = .66

t (Pooled) .96 degrees of freedom 193 P = .338

TABLE 26

SHOULD USE OF MODELS BE FOSTERED

Description	Project Leaders		Administrators	
	n	%	n	%
Yes	125	(97.7)	64	(98.5)
No	3	(2.3)	1	(1.5)

Total - n = 193

Chi-Square 0.137 with 1 degree of freedom
P .85 .90

V. ANALYSIS OF FINDINGS BY INSTITUTIONAL CLASSIFICATION

The findings supported the assumption that institution type is a factor worthy of consideration when evaluating the relative success of the model. Responses did vary significantly by institution type (Tables 27-28) on certain questions. Classification of the institution as public or private did not, however, have a significant effect on success.

In an attempt to determine whether the usefulness and success of models varied significantly with the type of institution utilizing the model, the data were retabulated by the classification of the institutions as public or private and by the highest degree offered (institution type).

Value Of Modeling

Four questions dealing with the value of modeling were selected for both of these analyses. The questions were on the following issues:

1) success/failure of the model,
2) satisfaction of initial objectives,
3) value of models for decisions respondent must make, and
4) likelihood of model usage in their institutions.

Since it was the institution's characteristics that were now under scrutiny, only the responses to the first questionnaire were needed in these tabulations. Institutions that were not using any of the models selected for this study were excluded, as were institutions that had developed their own models.

Public Or Private Institution

(1) On the question of success/failure, the acceptance mean was slightly higher among private institutions than public institutions, but the variance is not significant.

(2) The same pattern emerges in the responses of public and private institutions on the question of whether the initial objectives were satisfied. The mean for private institutions is slightly higher than for public, but the statistical measure did not reveal a significant variance between the two.

(3) The responses to the question of the value of the model for the respondent did not reveal any significant difference between the private and public institutions.

(4) Likelihood of model use was not significantly related to the institution's classification as public or private.

In short, we find that, although the mean for each of the questions is slightly higher for private institutions, public and private institutions seem to have had similar degrees of success or failure. Further, models are perceived to be as appropriate for private institutions as they are

TABLE 27

VALUE OF THIS MODEL FOR DECISIONS THE RESPONDENT MUST MAKE AT THEIR INSTITUTION BY INSTITUTION TYPE

Weight	Description		1*		4	5	6	9
1	Not at all valuable	n	9	1		1	4	
		%	25.0	7.1		7.1	10.3	
2	Somewhat valuable	n	15	4	9	2	17	1
		%	41.7	28.6	69.2	14.3	43.6	33.3
3	Very valuable	n	9	8	3	10	10	1
		%	25.0	57.1	23.1	71.4	25.6	33.3
4	Extremely valuable	n	3	1	1	1	8	1
		%	8.3	7.1	7.7	7.1	20.5	33.3
	Total - n = 119	n	36	14	13	14	39	3
		%	30.3	11.8	10.9	11.8	32.8	2.5
	Mean		2.166	2.642	2.384	2.785	2.564	3.000
	Standard Deviation		0.910	0.744	0.650	0.699	0.940	1.000

Chi-Square 27.258 with 15 degrees of freedom
P .02 < .05

* The institution codes in the above table are identical to those in TABLE 65.

TABLE 28

LIKELIHOOD OF ANY MODEL BEING USED
IN YOUR INSTITUTION BY INSTITUTION TYPE

Weight	Description		1*	2	4	5	6	9
1	No possibility	n	2			1		
		%	5.3			6.7		
2	Some possibility	n	16	4	3	3	10	
		%	42.1	28.6	21.4	20.0	22.2	
3	Good possibility	n	11	8	9	8	13	4
		%	28.9	57.1	64.3	53.3	28.9	80.0
4	Virtual certainty	n	9	2	2	3	22	1
		%	23.7	14.3	14.3	20.0	48.9	20.0
	Total	n	38	14	14	15	45	5
		%	29.0	10.7	10.7	11.5	35.4	3.8
	Mean		2.710	2.857	2.928	2.866	3.266	3.200
	Standard Deviation		0.897	0.662	0.615	0.833	0.809	0.447

Chi-Square 26.892 with 15 degrees of freedom
P .02 < .05

* The institution codes in the above table is identical to those in TABLE 65.

for public institutions and are as likely to be used in the future in public institutions as in private institutions.

The same questions were analyzed by the highest degree offered.

Highest Level Of Offering

(1) Little difference was observed concerning success/failure by institution type. The wide variance between the 2.800 mean acceptance score from boards, commissions and ministries and the 1.818 score from institutions offering a 4 or 5 year baccalaureate degree is noteworthy. The high rating of category nine (boards, commissions, ministries) is even more important when one considers that this group ranked all four questions higher than any other group of institutions did.

(2) Analysis of satisfaction of initial objectives by institution type follows a pattern similar to the one above as regards success/failure. In this case, boards, commissions and ministries rated this the highest (2.400), but the divergence in the range of the means is not nearly as large as it was for success/failure (.40 vs. .97). In this case, institutions that offered doctoral degrees said that fewer objectives were satisfied, as indicated by a mean of 2.050, but this variance was not statistically significant.

(3) The value of the model to the respondent does vary significantly by the institution in which the respondent is employed. Table 27 shows that second to boards come institutions that offer master's degrees but do not offer doctorates. They are followed by institutions offering baccalaureate degrees and institutions offering doctoral degrees. Representatives of two-year institutions, which, as previously reported, were the early users of models, ranked the value of models the lowest.

(4) The likelihood of future use also seems to be contingent on institution type (Table 28). While all of the means on this variable are high in comparison to others--such as success/failure--a clear pattern does emerge. Two-year institutions, whose respondents perceived models to be of least possible use, are the least likely to use models in the future. On the other hand, universities (institutions offering doctorates) are the most likely users, followed closely by boards, commissions, and ministries.

VI. SUCCESSES AND PROBLEMS

The respondents were asked to rank in order of importance the three factors that contributed to a successful implementation, and the three factors that caused the most problems. The project leaders' perceptions are reported in Table 29 and the administrators' in Table 30.

Success Factors

The assumption that success will vary according to the model used cannot be supported by the findings of this study, since a number of analyses of the variables were done by model and all indicated that there wasn't any conclusive link between success or satisfaction of initial objectives, and the particular model used.

Assessment of variance of factors contributing to success according to the model used did not reveal a significant difference. Cost was noted as a factor by 20 percent of the PLANTRAN users and 14.3 percent of the RRPM users and was not noted as a factor contributing to success by CAMPUS or SEARCH users. Successful use of consultants seems to have been a good result peculiar to CAMPUS users.

The importance of organizational involvement at a sufficiently high level is evidenced in an analysis of Table 29, which shows that in 26.1 percent of the 88 project leaders' responses this was the most important factor contributing to a successful implementation. Another 22.7 percent believed that the model itself was the prime reason for success and 17 percent believed that in-house technical expertise was the most important factor. The importance of the model itself in contributing to success was ranked second by 17.4 percent and third by 18.5. Totaling these, we find that 58.6 percent of the project leaders believed that the particular model was one of the three most important reasons for success. Low cost was considered an important reason for success by 42.2 percent of the project leaders who ranked it the first, second or third most important factor.

The views of the administrators are summarized in Table 30. An important point to note here is the addition of one category--availability of an adequate data base--to the list of possible responses. This oversight in the design of the questionnaire to project leaders was brought out by the intitial return, in which a number of respondents wrote this reason in the "other" category as a factor causing particular problems.

The results in Table 30 show that organizational commitment was ranked first by administrators as well as project leaders. They rated in-house technical expertise higher than the model itself as a factor contributing to success, and cost didn't seem as important a factor among administrators as it was among project leaders.

TABLE 29

FACTORS THAT PROJECT LEADERS FELT CONTRIBUTED TO SUCCESSFUL IMPLEMENTATION

	Rank 1 n	%	Rank 2 n	%	Rank 3 n	%
1. Cost	11	(12.5)	15	(17.4)	10	(12.3)
2. The model itself	20	(22.7)	15	(17.4)	15	(18.5)
3. Technical expertise required in-house	15	(17.0)	8	(9.3)	13	(16.0)
4. Organizational commitment at sufficiently high level	23	(26.1)	6	(7.0)	7	(8.6)
5. Commitment to integrate use of the model into the day-to-day decision making process	5	(5.7)	6	(7.0)	4	(4.9)
6. Use of consultants	2	(2.3)	3	(3.5)	3	(3.7)
7. Education for project staff, and key users	5	(5.7)	7	(8.1)	5	(6.2)
8. Availability of personnel to work on project	4	(4.5)	12	(14.0)	11	(13.6)
9. Computer related activities	2	(2.3)	10	(11.6)	8	(9.9)
10. Other	1	(1.1)	4	(4.7)	5	(6.2)
Total	88		86		81	

TABLE 30

FACTORS THAT ADMINISTRATORS FELT
CONTRIBUTED TO SUCCESSFUL IMPLEMENTATION

		Rank 1 n %	Rank 2 n %	Rank 3 n %
1.	Cost	3 (5.7)	1 (2.0)	4 (8.9)
2.	The model itself	7 (13.2)	6 (11.8)	8 (17.8)
3.	Technical expertise required in-house	11 (20.8)	4 (7.8)	4 (8.9)
4.	Organizational commitment at sufficiently high level	15 (28.3)	10 (19.6)	4 (8.9)
5.	Commitment to integrate use of the model into the day-to-day decision making process		5 (9.8)	1 (2.2)
6.	Use of consultants	4 (7.5)	3 (5.9)	5 (11.1)
7.	Education for project staff, and key users	5 (9.4)	3 (5.9)	
8.	Availability of personnel to work on project	2 (3.8)	7 (13.7)	6 (13.3)
9.	Computer related activities	4 (7.5)	7 (13.7)	5 (11.1)
10.	Availability of an adequate data base	1 (1.9)	5 (9.8)	8 (17.8)
11.	Other	1 (1.9)		
		53	51	45

Problems

The findings show that lack of an adequate data base and lack of organizational commitment were factors causing the most problems.

The factors that project leaders said had caused problems are presented in Table 31. A review of this table reinforces the assumption that organizational commitment is necessary; twenty percent of the 110 respondents identified lack of commitment as the principal problem source, and another 20 percent identified the lack of available personnel (also implying lack of organizational commitment) as the number one problem. Relatively few (8.2%) of the respondents believed that the model itself was deficient or that necessary in-house expertise was a limitation; cost did not loom as a large problem.

The "other" category rating of 15.5 percent may seem quite high, but this is due to poor questionnaire design; over half of these write-in respondents cited problems caused caused by the lack of an adequate data base.

In the aggregate, availability of personnel to work on the project appeared as a factor on 56.4 percent of the responses and organizational commitment appeared on 35.3 percent. Education, computer-related activities and commitment to integrate use of the model into the day-to-day decision-making process were important secondary rankings.

The factors that administrators identified as causing problems are reported in Table 32. The single most important factor causing problems was the lack of an adequate data base, which was identified by 25.4 percent of the respondents. This high ranking by administrators raises the question of how many project leaders would have selected this factor had it been available. Since 8.2 percent of the project leaders wrote this in as a problem, the response probably would have been significantly higher, since it is easier to check an item listed than to write it in.

Administrators also identified lack of personnel to work on the project (18.6%) and inadequate organizational commitment at a sufficiently high level (16.9%) as problem sources.

An analysis of the factors that caused problems by model is found in Table 33. In this case, the statistical test did result in a significant difference. A significant percentage of CAMPUS users identified the model itself as the source of the problem. CAMPUS and PLANTRAN users also identified lack of in-house technical expertise as a source of problems, whereas RRPM users did not. Whether this reflects the quality of the people employed or the difficulty of implementing the particular model is impossible to determine from these data.

Lack of organizational commitment seems to be a particular problem for RRPM users and to a lesser extent for PLANTRAN users. This response may well be tied to the cost factor. Reviewing the data in Table 17 (Primary Reasons for Selection by Model) we find that 43.8 percent of the PLANTRAN users and 31 percent of the RRPM users identified low acquisition cost as the primary reason for the selection of the model. Since this was the reason for acquisition, it is quite possible that organizational commitment or approval was not required prior to acquiring the model. As will be noted later, a considerable number of project

TABLE 31

FACTORS THAT PROJECT LEADERS FELT CAUSED PROBLEMS DURING IMPLEMENTATION

	Rank 1 n	Rank 1 %	Rank 2 n	Rank 2 %	Rank 3 n	Rank 3 %
1. Cost	5	(4.5)	3	(2.8)	3	(2.9)
2. The model itself	9	(8.2)	11	(10.4)	7	(6.9)
3. Technical expertise required in-house	9	(8.2)	12	(11.3)	13	(12.7)
4. Organizational commitment at sufficiently high level	22	(20.0)	8	(7.5)	8	(7.8)
5. Commitment to integrate use of the model into the day-to-day decision making process	11	(10.0)	13	(12.3)	11	(10.8)
6. Use of consultants	2	(1.8)	2	(1.9)	3	(2.9)
7. Education for project staff, and key users	8	(7.3)	18	(17.0)	9	(18.6)
8. Availability of personnel to work on project	22	(20.0)	23	(21.7)	15	(14.7)
9. Computer related activities	5	(4.5)	13	(12.3)	11	(10.3)
10. Other	17	(15.5)	3	(2.8)	12	(11.8)
Total	110		106		102	

TABLE 32

FACTORS THAT ADMINISTRATORS FELT CAUSED PROBLEMS DURING IMPLEMENTATION

	Rank 1 n	Rank 1 %	Rank 2 n	Rank 2 %	Rank 3 n	Rank 3 %
1. Cost			1	(1.7)	2	(3.5)
2. The model itself	5	(8.5)	1	(1.7)	4	(7.0)
3. Technical expertise required in-house	5	(8.5)	12	(20.3)	6	(10.5)
4. Organizational commitment at sufficiently high level	10	(16.9)	5	(8.5)	9	(15.8)
5. Commitment to integrate use of the model into the day-to-day decision making process	6	(10.2)	8	(13.6)	4	(7.0)
6. Use of consultants			1	(1.7)	1	(1.8)
7. Education for project staff, and key users	4	(6.8)	9	(15.3)	6	(10.5)
8. Availability of personnel to work on project	11	(18.6)	9	(15.3)	10	(17.5)
9. Computer related activities			3	(5.1)	4	(7.0)
10. Availability of an adequate Data Base	15	(25.4)	9	(15.3)	10	(17.5)
11. Other	3	(5.1)	1	(1.7)	1	(1.8)
Total	59		59		57	

TABLE 33

FACTORS (RANK 1) THAT PROJECT LEADERS FELT CAUSED PROBLEMS DURING IMPLEMENTATION BY MODEL

	CYCTUS n %	PLANTMAN n %	RHEM n %	SEARCH n %
1. Cost	1 (4.5)		3 (4.0)	1 (50.0)
2. The model itself	5 (22.7)		4 (5.3)	
3. Technical expertise required in-house	4 (18.2)	2 (18.2)	3 (4.0)	
4. Organizational commitment at sufficiently high level	1 (4.5)	2 (18.2)	19 (25.3)	
5. Commitment to integrate use of the model into day-to-day decision making process	3 (13.6)	2 (18.2)	6 (8.0)	
6. Use of consultants	2 (9.2)			
7. Education for project staff, and key users		1 (9.1)	7 (9.3)	
8. Availability of personnel to work on project	5 (22.7)	2 (18.2)	14 (18.7)	1 (50.0)
9. Computer related activities	1 (4.5)		4 (5.3)	
10. Other		2 (18.2)	15 (20.0)	
Total - n = 110	22 (20.0)	11 (10.0)	75 (68.2)	2 (1.8)

Chi-Square 45.333 with 27 degrees of freedom
P < .02

leaders merely decided to acquire the model and implement the software. A person using this approach would be seeking willing participants to use the model only after its implementati

CAMPUS users were divided on the issue of consultants; half said they had experienced success with consultants, but an equal number cited the use of consultants as the factor causing the greatest problem (rank 1) during implementation.

The greatest number noting problems caused by the lack of an adequate data base were RRPM users, although users of all the models experienced this difficulty.

Disposition to Innovation

Institutions that are perceived by their members as disposed to acceptance of innovation and new ideas do indeed register a greater success with the use of models than do those institutions whose members do not perceive them as being disposed to innovation.

That disposition of the institution towards change would affect the success or failure of models was one of the underlying assumptions of this study. The responses to the question of whether the respondent thought the administrative strategy of the institution allowed ready acceptance of innovation and new ideas are found in Table 34 (project leaders) and Table 35 (administrators). Forty-seven percent of the project leaders and 57.4 percent of the administrators said that their institutions were disposed towards change. The result of a t-test on the means resulted in t = .159 with 195 degrees of freedom and a probability of .114 and thus no significant difference in the responses of the two groups.

Two tables (36-37) were developed to analyze the relationship between success and disposition to change. In Table 36, the extent to which the initial objectives were satisfied are compared with the institution's disposition to change. The result of the Chi-Square indicates that the probability that this response would occur if chance were the only factor at work is less than 5 percent. Analyzing the responses, it is unclear exactly what factors are at work, since institutions that had satisfied none of their original objectives were spread across the spectrum of institutions from those not at all disposed to change to those that are extremely disposed to change. Similarly, 50 percent of the institutions (31) viewed as very disposed towards innovation had satisfied only some of their original objectives.

The relationship of success or failure to the disposition of the institution towards innovation appears on Table 37. In this case, we find that there is a significant difference between the two variables and that this distribution would occur by chance in less than one in one thousand cases. The table indicates that if an institution is disposed to change there is a high possibility that it will experience a successful implementation of a model. The fact that 25 institutions (58 percent of the highly successful implementations) that were "very disposed" towards innovation and the 10 institutions (23% of the highly successful) that were "extremely disposed" to innovation experienced a high degree of success in the implementation of the model seems to buoy this contention. On the other end of the scale, of the 23 respondents

TABLE 34

ADMINISTRATIVE STRATEGY OF INSTITUTION
ALLOWS READY ACCEPTANCE OF INNOVATION AND NEW IDEAS
PROJECT LEADERS

Weight	Description	Number	Percentage
1	Not at all disposed	9	6.6
2	Somewhat disposed	63	46.3
3	Very disposed	47	34.6
4	Extremely disposed	17	12.5
	Total	136	100.0
	Mean	2.529	
	Standard Deviation	0.797	

TABLE 35

ADMINISTRATIVE STRATEGY OF INSTITUTION
ALLOWS READY ACCEPTANCE OF INNOVATION AND NEW IDEAS
ADMINISTRATORS

Weight	Description	Number	Percentage
1	Not at all disposed	1	1.6
2	Somewhat disposed	25	41.0
3	Very disposed	25	41.0
4	Extremely disposed	10	16.4
	Total	61	100.0
	Mean	2.721	
	Standard Deviation	0.755	

TABLE 36

RELATIONSHIP OF USEFULNESS OF MODELS AND DISPOSITION OF INSTITUTION TOWARDS INNOVATION AND NEW IDEAS

SATISFACTION OF OBJECTIVES		INNOVATION			
Weight	Description	1 Not at all Disposed n %	2 Somewhat Disposed n %	3 Very Disposed n %	4 Extremely Disposed n %
1	None	3 (37.5)	8 (11.3)	4 (6.5)	4 (17.4)
2	Some	3 (37.5)	44 (62.0)	31 (50.0)	6 (26.1)
3	A considerable number	1 (12.5)	16 (22.5)	24 (38.7)	12 (52.2)
4	All	1 (12.5)	3 (4.3)	3 (4.8)	1 (4.3)
	Total - n = 164	8 (4.8)	71 (43.3)	62 (37.8)	23 (14.0)

Chi-Square 19.166 with 9 degrees of freedom
P .02 < .05

TABLE 37

RELATIONSHIP OF SUCCESS/FAILURE AND DISPOSITION OF INSTITUTION TOWARDS INNOVATION AND NEW IDEAS

SUCCESS/FAILURE		INNOVATION			
Weight	Description	1 Not at all Disposed n %	2 Somewhat Disposed n %	3 Very Disposed n %	4 Extremely Disposed n %
1	A dismal failure	4 (50.0)	10 (12.8)	6 (9.1)	3 (14.3)
2	Somewhat successful	2 (25.0)	61 (78.2)	35 (53.0)	8 (38.1)
3	Highly successful	2 (25.0)	6 (7.7)	25 (37.9)	10 (47.6)
4	An overwhelming success	_____	1 (1.3)	_____	_____
	Total - n = 173	8 (4.6)	78 (45.1)	66 (38.2)	21 (12.1)

Chi-Square 36.297 with 9 degrees of freedom
P < .001

that indicated that the model was a dismal failure at their institutions, 14 (61%) said their institutions were not at all or only somewhat disposed to innovation.

Finally, 51 (58%) of the 106 institutions that the respondents perceived as only somewhat disposed to acceptance of innovation and new ideas had only somewhat successful use of models.

The relationship of relative degree of success to other variables is explored in Tables 38 and 39. The variables considered are the respondents' views of the usefulness of models for managing an institution of higher education and the likelihood of model-use in his or her institution in the future. The Chi-Squares calculated for both of these sets of variables indicate an extremely low possibility (less than one-tenth of one percent) that this distribution would have occurred by chance alone.

Predicted Use Based on Success or Failure Experienced

Table 38 indicates that there is little relationship between success or failure and the respondents' views of the usefulness of models. This is evidenced by the weighting of the scale towards a lower left-hand quadrant. Curiously, 14 of the 23 persons (61%) indicating that the project had been a dismal failure also believed that models can contribute greatly or are an absolute necessity in managing an institution. Equally significant is the fact that 88 persons (79%) recorded only mild success yet felt that models were either a necessity or can contribute greatly to managing an institution. On the other hand, one could argue that a more logical relationship exists, since of the 44 individuals indicating a high degree of success, 42 felt that models can either contribute greatly or are an absolute necessity in managing the institution.

A review of Table 39 reveals that the data are not nearly as muddled as those that appear in Table 38. To begin with, it must be remembered that the mean for the likelihood of use was considerably higher (2.977 for project leaders and 3.076 for administrators) than it was for success/failure (2.083 for project leaders and 2.196 for administrators). Here we find that all 44 institutions that recorded a high degree of success indicated that there was a good possibility or a virtual certainty that they would be used in the future. Conversely, of the 24 institutions that recorded dismal failures, 16 (66%) said that there was either no possibility or only some possibility that the model would be used in the face of this disaster. The positive association of the two variables is supported by the results of the Gamma test shown at the bottom of the table.

Respondents who said they valued the models for decisions they must make in their own staff positions also rated highly the usefulness of models for managing an institution (Table 40). The 47 respondents said models can contribute greatly or are an absolute necessity in assisting with the management of an institution, but also said that models were only somewhat valuable to them in their positions; apparently these respondents believe models are useful to other individuals within the institution.

The data in Table 41 identify a direct relationship between the respondents' perceptions of the usefulness of models in managing an institution and the likelihood that a model will be used by the institutions

TABLE 38

RELATIONSHIP OF SUCCESS/FAILURE AND USEFULNESS OF MODELS IN MANAGING INSTITUTIONS

USEFULNESS		SUCCESS/FAILURE			
Weight	Description	1 A Dismal Failure n %	2 Somewhat Successful n %	3 Highly Successful n %	4 An Overwhelming Success n %
1	Not at all		1 (0.9)		
2	Somewhat	9 (39.1)	23 (20.5)	2 (4.5)	
3	Can contribute greatly	12 (52.2)	77 (68.8)	21 (47.7)	
4	An absolute necessity	2 (8.7)	11 (9.8)	21 (47.7)	1 (100.0)
	Total - n = 180	23 (12.8)	112 (62.2)	44 (24.4)	1 (0.6)

Chi-Square 39.311 with 9 degrees of freedom
P < .001
GAMMA = 0.673

TABLE 39

RELATIONSHIP OF SUCCESS/FAILURE AND
LIKELIHOOD OF MODEL USE IN INSTITUTION

	LIKELIHOOD OF USE	SUCCESS/FAILURE			
Weight	Description	1 A Dismal Failure n %	2 Somewhat Successful n %	3 Highly Successful n %	4 An Overwhelming Success n %
1	No possibility	4 (16.7)			
2	Some possibility	12 (50.0)	35 (32.1)		
3	Good possibility	6 (25.0)	50 (45.9)	15 (34.1)	
4	Virtual certainty	2 (8.3)	24 (22.0)	29 (65.9)	1 (100.0)
	Total - n = 178	24 (13.5)	109 (61.2)	44 (24.7)	1 (0.6)

Chi-Square 72.293 with 9 degrees of freedom
P < .001
GAMMA = .752

TABLE 40

RELATIONSHIP OF USEFULNESS OF MODELS
TO MANAGING AND VALUE OF MODELS TO RESPONDENT

	VALUE TO RESPONDENT	USEFULNESS OF MODELS 1	2	3	4
Weight	Description	Not At All n %	Somewhat n %	Can Contribute Greatly n %	An Absolute Necessity n %
1	Not at all valuable		7 (20.6)	9 (8.0)	1 (3.0)
2	Somewhat valuable		22 (64.7)	40 (35.4)	7 (21.2)
3	Very valuable		5 (14.7)	51 (45.1)	15 (45.5)
4	Extremely valuable	1 (100.0)		13 (11.5)	10 (30.3)
	Total - n = 181	1 (0.6)	34	113 (62.4)	33 (18.2)

Chi-Square 40.287 with 9 degrees of freedom
P < .001
GAMMA = 0.547

they represent. The higher percentages in the lower right-hand quadrant of the table support this contention. There seems to be a strong tendency to rate likelihood of use higher than the usefulness of models. This is evidenced by the 15 persons who said there was a good possibility that the model would be used but who also felt that models are only somewhat useful.

The relationship of the value of the model for the respondent to the likelihood of a model's being used by his or her institution is depicted in Table 42. While a few persons who believed models were not at all valuable also said that there was a good possibility or a virtual certainty that models will be used, the trend in this chart is in the other direction: namely, the higher an individual's perception of the value, the likelier the institution is to use it. However, the likelihood of use seems to apply even when the respondent perceives the model as only somewhat valuable, evidenced by 30 persons reporting that there was a good possibility of future use and eight who said there was a virtual certainty models would be used even when the respondents found them only somewhat valuable. This is also attributable to the high mean score of likelihood of use.

The relationship of satisfaction of initial objectives to likelihood of use (Table 43) indicates that institutions that satisfy all or a considerable number of their objectives are extremely likely to use models in the future. However, even those institutions that registered only some measure of success in meeting their objectives--and to a lesser extent those that satisfied none of their original objectives--are also likely to use models in the future.

Reviewing the data in Tables 41, 42 and 43, all dealing with the likelihood of use, it seems that models will be used regardless of whether individuals perceive them as useful either for themselves or their institutions, and even when institutions have had a relative lack of success in meeting objectives. To be sure, a positive attitude towards models and their use increases the possibility of their future use, but individuals--and apparently, institutions--have not been dissuaded by the fact that success has been modest. Since the questionnaire dealt with the respondents' current experiences, it is not known whether this high likelihood of future use is motivated by external pressure or by a number of the other factors that were indicated earlier as reasons for use of the model. Future data collection might focus on the reasons that individuals perceive that models are likely to be used in their institutions in the future.

TABLE 41

RELATIONSHIP OF USEFULNESS OF MODELS IN MANAGING AND LIKELIHOOD OF MODEL USE IN INSTITUTION

		USEFULNESS OF MODELS			
	LIKELIHOOD OF USE	1	2	3	4
Weight	Description	Not At All	Somewhat	Can Contribute Greatly	An Absolute Necessity
		n %	n %	n %	n %
1	No possibility		1 (2.8)	2 (1.7)	1 (2.8)
2	Some possibility		18 (50.0)	26 (21.5)	4 (11.1)
3	Good possibility		15 (41.7)	62 (51.2)	7 (19.2)
4	Virtual certainty	1 (100.0)	2 (5.6)	31 (25.6)	24 (66.7)
	Total - n = 194	1 (0.5)	36 (18.6)	121 (62.4)	36 (18.6)

Chi-Square 45.796 with 9 degrees of freedom
P < .001
GAMMA = 0.554

TABLE 42

RELATIONSHIP OF VALUE OF MODEL FOR
RESPONDENT AND LIKELIHOOD OF USE IN INSTITUTION

	LIKELIHOOD OF USE	VALUE OF MODELS			
Weight	Description	1 Not at all Valuable n %	2 Somewhat Valuable n %	3 Very Valuable n %	4 Extremely Valuable n %
1	No possibility	2 (12.5)	1 (1.4)	1 (1.4)	
2	Some possibility	9 (56.3)	31 (44.3)	6 (8.6)	
3	Good possibility	3 (18.8)	30 (42.9)	37 (52.9)	7 (29.2)
4	Virtual certainty	2 (12.5)	8 (11.4)	26 (37.1)	17 (70.8)
	Total - n = 180	16 (8.9)	70 (38.9)	70 (38.9)	24 (13.3)

Chi-Square 67.587 with 9 degrees of freedom
P < .001
GAMMA = 0.689

TABLE 43

RELATIONSHIP OF SATISFACTION OF INITIAL OBJECTIVES
AND LIKELIHOOD OF USE IN INSTITUTION

Weight	LIKELIHOOD OF USE Description	INITIAL OBJECTIVES SATISFIED 1 None n %	2 Some n %	3 Considerably n %	4 All n %
1	No possibility	2 (10.5)	1 (1.2)		1 (12.5)
2	Some possibility	10 (52.6)	27 (31.8)	4 (7.1)	1 (12.5)
3	Good possibility	3 (15.8)	42 (49.4)	20 (35.7)	2 (25.0)
4	Virtual certainty	4 (21.0)	15 (17.6)	32 (57.1)	4 (50.0)
	Total - n = 168	19 (11.3)	85 (50.6)	56 (33.3)	8 (4.8)

Chi-Square 45.598 with 9 degrees of freedom
P < .001
GAMMA = 0.555

VII. CONCLUSIONS AND FUTURE DIRECTIONS

Some authors think the models now available are inherently deficient, and believe the next step should be to improve the models themselves. Even Balderston, who generally supports new management techniques, notes that,

> RPM has been tried in a number of institutions. The approach permits fine-grained estimation of resources used in instruction. It does not as yet treat problems of joint processes, and joint products, and research universities therefore can only make limited use of it.[7]

Similarly, Dresch, in a discussion of the administration/system sciences approach to policy analysis, argues that,

> . . . the development of comprehensive models . . . should be undertaken . . . but must be seen first as a program of research, and secondarily as a contribution to planning.[8]

These criticisms may be well taken, but the findings of this research effort do not substantiate the need for the development of more sophisticated models in order for them to be useful. The comments of many of the respondents indicate just the opposite need, namely, to simplify the available models and reduce the volume of computer output that the systems produce. Here are some typical comments:

> The key problem is not with the technical aspects of the models, but with fostering their use. A better understanding of how these tools have been used by others would be of great help.
>
> Models must be much less detailed and complex than the one we used.
>
> The institution must choose the questions to be answered, not the designer or programmer.
>
> Models rapidly become too complex . . . and it becomes confused with the real world in the eyes of the user.
>
> There has been a tendency of vendors to oversell the models. They never fully describe the work it takes to establish the data for these models.
>
> Analytical models should be advertised as only aids in decision making. Do not oversell as the answer to all problems.
>
> We selected a model that was far too complex for the institution's needs.

> _____ is available through our service bureau; we also purchased _____ based on propaganda put at a meeting sponsored by _____. However, we have been unable to use these models because, contrary to the system documentation, the assumptions upon which the program logic is based do not meet our organizational structure. Therefore, it has not been possible to use the models without extensive modification for which we have neither the time, money, nor expertise.
>
> Analytical models which are simple, like _____, are extremely flexible and can be used, modified to meet many planning and management information needs . . . The difficulty is not to try to model the problem, circumstance, or situation, but only that portion which yields readily and simply to quantification.

Bell seems to agree with the users and with the findings of this study when he states, "More serious than shortcomings in the way that a simulation model transforms its inputs into outputs, are the problems in the implementation and interpretation of the model."[9] Evans' research also noted this same difficulty: " . . . the problem of technical implementation may be a minor one; once accomplished, the human implementation problem--the task of getting the system utilized--may still remain."[10] Millett would also agree that administrators can't wait for the development of more sophisticated models before using them. As early as 1968 he said that " . . . planning depends upon knowledge but cannot wait for research to produce new knowledge upon the basis of which more effective plans might be produced."[11]

The responses also reflect continuing frustration and cynicism, evidenced by such respondent comments as:

> Implementation was a typical example of project failure due to the lack of serious involvement by administrators.
>
> Our Presidents need to be more management oriented.
>
> The dynamics of a postsecondary institution are too rapid for a model to respond to quickly enough. The forces shaping the path of education are not amenable to mathematical analysis.
>
> Cooperation between academics of all levels, and administrators must be carefully nurtured if analytical models are to have any continuing significance.
>
> The model should fit the institution, and not the institution fit the model.
>
> There is a need for greater simplification (we have an output glut!).
>
> Two preconditions are essential: 1) institutional commitment, and 2) an adequate data base.
>
> The biggest stumbling block is the unwillingness of many to take

the outcomes seriously. The "survival" frame of mind in the last three years has made prognosis and planning very unpopular.

We must wait until ancient, parochial, conservative, non-system oriented management passes on.

The comments of a management consulting firm that reviewed the implementation of one of the models in several institutions encapsulates the comments made by the users who responded to the survey. They are as follows:

> The system is not functioning as an adequate planning tool due to the following:
>
> 1) The size and complexity of the model dominate the planning process. Many people view _____ as the planning exercise itself rather than as an aid to support the process.
> 2) Too few people in the colleges have adequate understanding of the logic and interrelationships of the model.
> 3) Actual results are not being systematically compared to planned results.
> 4) Only a few colleges applied the results of the multi-year plan to development of their annual budget. Others consider the model to be too rigid to fit their particular organizational structure.
> 5) Many colleges believe that _____ is not an effective simulation tool. The time and effort required to prepare input is not worth the benefits; decisions can be better tested through less sophisticated methods.
> 6) _____ has encouraged the colleges to implement a formalized planning process; but the system is not generally considered a successful planning tool by the majority of the college administrators and board members.[12]

Summary

Both the interest in and utilization of analytical models have increased substantially since the research efforts of Evans, Gonyea (1971), and Wartgow (1972). The necessity for the institution to commit itself to assign personnel to implement the models and to utilize the model once implemented, continues to be of the utmost concern. The findings here show that there is considerably more willingness to rely on models for long-range planning than for day-to-day decision-making. Gonyea's observation in her study of institutions known to have access to planning or simulation models remains true; she identified the major problem as getting decision-makers to use the outputs and support the implementation of the planning system.[13] The mere number of institutions implementing such systems, while indicative of a trend, does not tell the whole story, since information about the support of the organization planning to use the model is also required. Casasco's findings are also very applicable today. He stated in his conclusion that,

> If these techniques are to be successfully integrated into the institutional planning process, the establishment of the socio-technological preconditions for the understanding acceptance and effective implementation of these tools is essential. The dynamics of institutional behavior and the sociological aspects of college and university management is a broad, pervasive, and engaging issue that certainly extends beyond the scope of this study into the realm of the behavioral sciences. However, the crucial role that this aspect of institutional management plays in the successful implementation of the techniques discussed here merits the careful consideration of both institutional researchers who are developing new analytical and forecasting techniques, as well as the institutional managers who would in the final analysis have to utilize them.[14]

As a concluding note, what advice might be offered from all this information for model builders and users?

1) *Importance of process.* It must be recognized that a significant number of professionals in the field believe that the process of using a model is as important as the model itself. The discipline required for data-gathering in a uniform fashion for input to the model and the attendant discussion on use of data output may well be the most viable aspects of model use.
2) *Model simplification.* Model-builders need to be aware of the model-users' desire for simplified input and output requirements.
3) *Data bases.* Users must develop operational data bases to support the use of models in the long-range planning process and in day-to-day decision-making processes.
4) *User education.* All administrators should participate in training sessions keyed to user education. It is one thing to train individuals to keep the model running, but it is quite another to develop constructive attitudes toward the usefulness of models. As one president noted, we must continue to educate our staff and batter at the stone walls of resistance and obstruction. Another respondent called for training sessions for all administrative levels, keyed to their potential use or need of the model.
5) *Organizational commitment.* Unless there is an organizational commitment from a high level to integrate the use of the model into the planning or decision-making processes, the model itself will remain a play-thing for the institutional researchers, computer center personnel, and other project leaders, and few significant benefits will be derived from its use. After all, what does it accomplish to have a perfect computer implementation of a modeling system if in the end it is not understood, not supported, or not used?

The main assumption--that there are few individual successes--seems to be supported. However, the spirit of the individuals responding to both questionnaries does not seem to have been dampened by their experience. While perceptions of success were less than positive, respondents did transmit positive indications that models can contribute to managing institutions of higher education, that they are valuable for the types

of decisions that they must make in their positions, and that there is a good possibility that the models will be used in their institutions in the future.

Future Research

This research uncovered a number of opportunities for additional research. They are as follows:

1. Investigation into the degree of satisfaction according to the level of sophistication or complexity of the model seems necessary to verify whether or not users would be more satisfied with simpler models.
2. Gathering additional information on the year of implementation would be useful to determine if there is a continued upward trend in model use or whether a lack of success in implementing models results in reduced usage in terms of number of institutions.
3. Investigation into the degree of success experienced by the year of implementation would seem useful. Whether this would indicate increased maturity on the part of the users or the development of more useful models is unknown, but either of these would be noteworthy.
4. Continued research on model usage by institution type seems to be warranted. The declining use of these techniques by two-year institutions and the increased use by boards and state-wide systems is significant and should be chronicled.
5. The cost of implementing and maintaining a modeling system was not precisely identified by this study (due to limitations in questionnaire design) and more data should be gathered, using more precise measures of cost.
6. The data did not reveal any significant differences in success or failure, satisfaction of original objectives, and difficulty of implementation by model, and additional data should be gathered, using more precise measures. One possibility is to ask for a response in terms of percentage of initial objectives satisfied or the percentage of success/failure rather than utilizing the four point scale that was relied upon in the survey instrument utilized in this study.
7. Since respondents indicated that there was a good possibility that models would be used for planning and decision-making in their institution in the future, it would be useful to gather data on the reasons that they perceive that models are likely to be used.

NAME OF RESPONDENT: _____ POSITION: _____

ADDRESS: _____

DESCRIPTION OF MAJOR RESPONSIBILITIES: _____ (Cont.) (over)

MODEL UTILIZED _____ VERSION _____ YEAR IMPLEMENTED _____

Please identify the key financial and academic administrators at your institution who have had the most involvement with the use of this model and are capable of assessing its usefulness:

ACADEMIC

NAME: _____

TITLE: _____

ADDRESS: _____

_____

FINANCIAL

NAME: _____

TITLE: _____

ADDRESS: _____

_____

I. QUESTIONS REGARDING INSTITUTIONAL CHARACTERISTICS AND THE SELECTION PROCESS

1. Do you think the administrative strategy of the institution allows ready acceptance of innovation and new ideas?

1 - Not at all disposed 2 - Somewhat disposed 3 - Very Disposed 4 - Extensively Disposed

REMARKS: _____

2. What was the title of the person(s) or group that initiated the search for this model? _____ _____

3. Under what conditions did the need to acquire a model become apparent? _____ _____ _____ _____

4. Was a statement of the objectives that the model was to serve prepared before the evaluation process began? 1 Yes 2 No

5. If yes, what concerns did this statement reflect? 1 - Institutional 2 - Sub-Unit 3 - External 4 - other

6. Please rank order the three most important initial OBJECTIVES:

Requirement for more useful data for day-to-day institutional management _____

Internal political requirement _____

External political requirement _____

Need for forecasting ability (consideration of alternatives) _____

Need for integration of institutional data _____

Better data required to react to external queries _____

Better data required to allocate increasingly scarce resources _____

Other: (Please specify) _____ _____

7. Who participated in identifying these objectives?(multiple responses are possible)

1 - Trustees 2 - Academic Administrators 3 - Faculty 4 - Students 5 - Financial Administrators 6 - Other

8. What percentage of the funds for the implementation of the model came from outside sources? _____ %

9. a. If funds would not have been forthcoming from an outside source, would this specific model have been selected and implemented? 1 Yes 2 No

b. Would any model have been selected and implemented? 1 Yes 2 No

10. How was the model selected? 1 - Individual 2 - Committee 3 - Consultant 4 - Other

11. Please rank order the three most important reasons why the specific model was selected:

Ease of use on a continuing basis _____

Low acquisition cost _____

Seemingly low operating costs _____

Sophistication of the model _____

Reports output _____

Flexibility of input _____

Promise of external support _____

Availability of external funds _____

Ease of initial implementation _____

Supported by existing computer equipment _____

Key administrator wanted it _____

Other (Please Specify) _____ _____

_____ _____

QUESTIONS REGARDING IMPLEMENTATION AND CURRENT UTILIZATION

1. a. Was an organizational unit created to implement the model? 1 - Yes 2 - No

b. If yes, what level of management did it report to organizationally? 1 - Middle 2 - Upper

c. For what length of time? Indefinitely _____ OR _____ years _____ months

d. How many people were in this unit? 1 2 3 4 5 or more

2. a. Was a process established to evaluate implementation? 1 - Yes 2 - No

b. If yes, when was this evaluation to occur? 1 - Periodically 2 - A final assessment

3. Was the use of the model considered a pilot project? 1 - Yes 2 - No

4. Has it been utilized since its original implementation? 1 - Yes 2 - No

5. a. Were consultants hired to assist in implementation? 1 - Yes 2 - No

b. If yes, what was their role? (multiple responses are possible)

1 - Evaluation 2 - Train staff 3 - Assist in implementation 4 - Implement system 5 - Maintain system

6. How much time was required to get the system operational? _____ years _____ months

7. a. What was the total cost of initial implementation?(include all costs: software, people, computer time, etc.)

1 - 0 - $25,000 2 - $25,001 - $50,000 3 - $50,001 - $75,000 4 - $75,000 up

b. What are the annual operating costs?

1 - 0 - $25,000 2 - $25,001 - $50,000 3 - $50,001 - $75,000 4 - $75,000 up

8. By what percentage did the costs exceed the budget? 1 - 0% 2 - 33 1/3% 3 - 66 2/3% 4 - 100% and over

9. To what extent have the original objectives been satisfied by the use of the model?

1 - None 2 - Some 3 - Considerably 4 - all

10. To what extent are administrative decisions based on the results of modelling?

1 - None 2 - Some 3 - Considerably 4 - all

11. What is the highest level in your institution that has consciously used the model in making any decisions?

1 - Operational 2 - Middle Management 3 - Vice-Presidents 4 - President

12. To what extent is more useful information available for day-to-day management as a result of the use of the model?

1 - None 2 - some 3 - much more 4 - extensive amount

13. To what extent is more useful information available for long-range planning as a result of the use of the model?

1 - None 2 - some 3 - much more 4 - extensive amount

14. To what extent is the use of the model now integrated with institutional data collection and processing?

1 - Not at all 2 - somewhat 3 - considerably 4 - completely

15. Please rank order the following twice. First, identify the three most important factors that caused problems during implementation and secondly, identify the three most important factors that contributed to the successful implementation of the model.

	PROBLEMS	SUCCESSES
Cost	_____	_____
The model itself	_____	_____
Technical expertise required in-house	_____	_____
Organizational commitment at sufficiently high level	_____	_____
Commitment to integrate use of the model into the day-to-day decision making process	_____	_____
Use of consultants	_____	_____
Education for project staff and key users	_____	_____
Availability of personnel to work on project	_____	_____
Computer related activities	_____	_____
Other: (Please Specify) _____	_____	_____
_____	_____	_____

16. Do you believe that the use of analytical models can contribute substantially to assisting in managing an institution of higher education?

1 - Not at all 2 - somewhat 3 - can contribute greatly 4 - an absolute necessity

17. To what extent would you consider the implementation or use of this model a success or failure at your institution?

1 - a dismal failure 2 - somewhat successful 3 - highly successful 4 - an overwhelming success

18. In your judgment what is the value of this model for the kind of decisions you must make in your position at your institution?

1 - not at all valuable 2 - somewhat valuable 3 - very valuable 4 - extremely valuable

19. What is the likelihood that this or any other model will be used for planning and decision-making in your institution?

1 - no possibility 2 - some possibility 3 - good possibility 4 - virtual certainty

20. In the light of your experience, should the use of analytical models in higher education administration be fostered?

1 - Yes 2 - No

If yes, what should be done? If no, why? _____

_____

_____

_____

_____

_____

_____

21. YES I would like a copy of the results of the survey.

NAME OF RESPONDENT: _____ POSITION: _____

INSTITUTION: _____ MODEL UTILIZED: _____

1. Do you think the administrative strategy of the institution allows ready acceptance of innovation and new ideas?

   1 - not at all disposed 2 - somewhat disposed 3 - very disposed 4 - extensively disposed

2. Please rank order the three most important initial OBJECTIVES:

   Requirement for more useful data for day-to-day institutional management _____

   Internal political requirement _____

   External political requirement _____

   Need for forecasting ability (consideration of alternatives) _____

   Need for integration of institutional data _____

   Better data required to react to external queries _____

   Better data required to allocate increasingly scarce resources _____

   Other: (Please Specify) _____

   _____

3. Please rank order the three most important reasons why the specific model was selected:

   Ease of use on a continuing basis _____

   Low acquisition cost _____

   Seemingly low operating costs _____

   Sophistication of the model _____

   Reports output _____

   Flexibility of input _____

   Promise of external support _____

   Availability of external funds _____

   Ease of initial implementation _____

   Supported by existing computer equipment _____

   Key administrators wanted it _____

   Other: (Please Specify) _____

   _____

4. To what extent have the original objectives been satisfied by the use of the model?

   1 - none 2 - some 3 - a considerable number 4 - all

5. To what extent are administrative decisions based on the results of modeling?

   1 - none 2 - some 3 - a considerable number 4 - all

6. What is the highest level in your institution that has consciously used the model in making any decisions?

   1 - Operational 2 - Middle Management 3 - Vice-Presidents 4 - President

7. To what extent is more useful information available for day-to-day management as a result of the use of the model?

   1 - none 2 - some 3 - much more 4 - extensive amount

8. To what extent is more useful information available for long-range planning as a result of the use of the model?

   1 - none 2 - some 3 - much more 4 - extensive amount

9. To what extent is the use of the model now integrated with institutional data collection and processing?

1 - Not at all 2 - somewhat 3 - considerably 4 - completely

10. Please rank order the following twice. First, identify the three most important factors that caused problems during implementation and secondly, identify the three most important factors that contributed to the successful implementation of the model.

	PROBLEMS	SUCCESSES
Cost	_____	_____
The model itself	_____	_____
Technical expertise required in-house	_____	_____
Organizational commitment at sufficiently high level	_____	_____
Commitment to integrate use of the model into the day-to-day decision making process	_____	_____
Use of consultants	_____	_____
Education for project staff and key users	_____	_____
Availability of personnel to work on project	_____	_____
Computer related activities	_____	_____
Availability of an adequate data base	_____	_____

Other (Please Specify) _____

_____

11. Do you believe that the use of analytical models can contribute substantially to assisting in managing an institution of higher education?

1 - Not at all 2 - somewhat 3 - can contribute greatly 4 - an absolute necessity

12. To what extent would you consider the implementation or use of this model a success or failure at your institution?

1 - a dismal failure 2 - somewhat successful 3 - highly successful 4 - an overwhelming success

13. In your judgment what is the value of this model for the kind of decisions you must make in your position at your institution?

1 - not at all valuable 2 - somewhat valuable 3 - very valuable 4 - extremely valuable

14. What is the likelihood that this or any other model will be used for planning and decision-making in your institution?

1 - no possibility 2 - some possibility 3 - good possibility 4 - virtual certainty

15. In the light of your experience, should the use of analytical models in higher education administration be fostered?

1 - Yes 2 - No

If yes, what should be done? If no, why? _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

16. YES I would like a copy of the results of the survey.

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